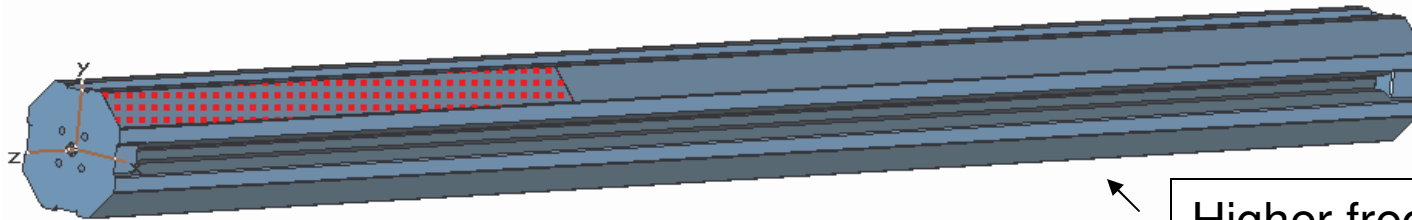


# RFQ Final Tuning

February 21, 2008

Gennady Romanov  
Andrei Lunin

Two weeks ago we concluded that the part of RFQ has got higher local frequency, but we didn't know why.



Normal

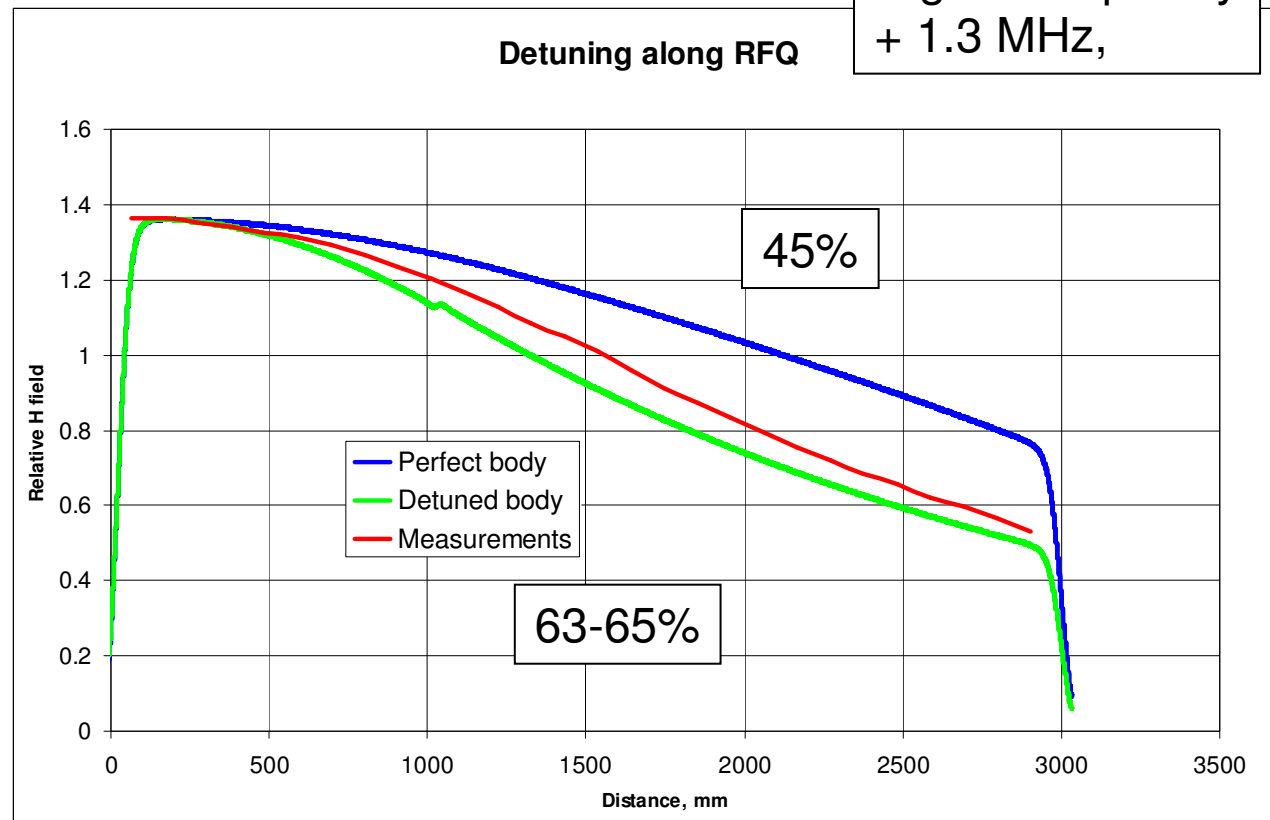
Higher frequency  
+ 1.3 MHz,

Detuning along RFQ

1.3 MHz ->  
1 mm for wall  
or  
48 microns for gap  
(+/- ~~30~~ microns  
RMS tolerance)

50

$F = 324.8 \text{ MHz}$



February 21, 2008

Gennady Romanov, Andrei Lunin

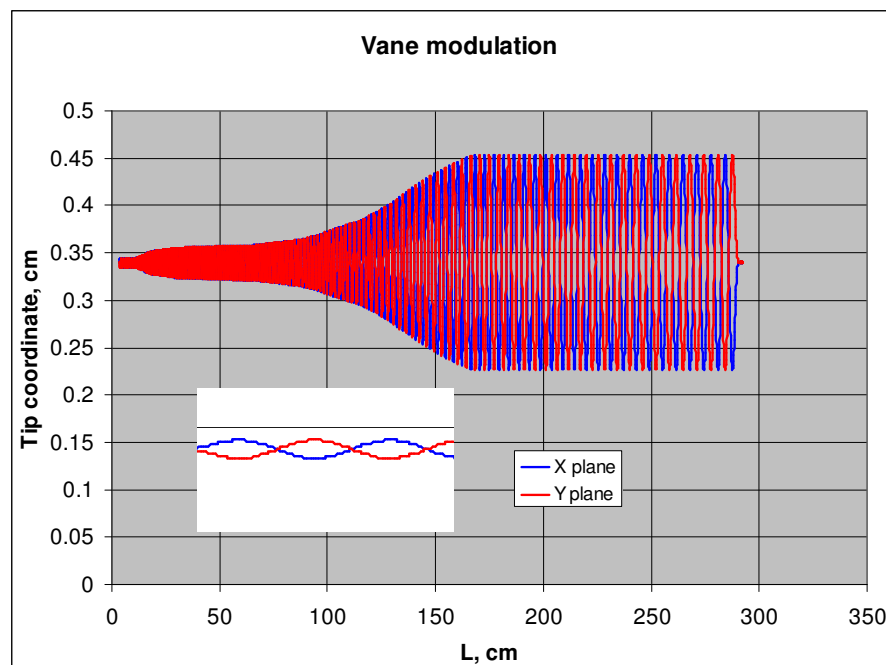
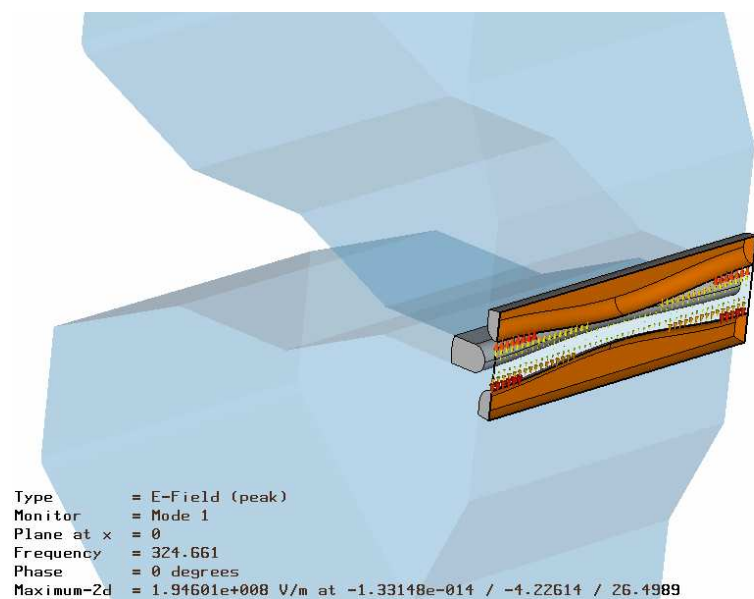
2

## Effect of vane tips modulation

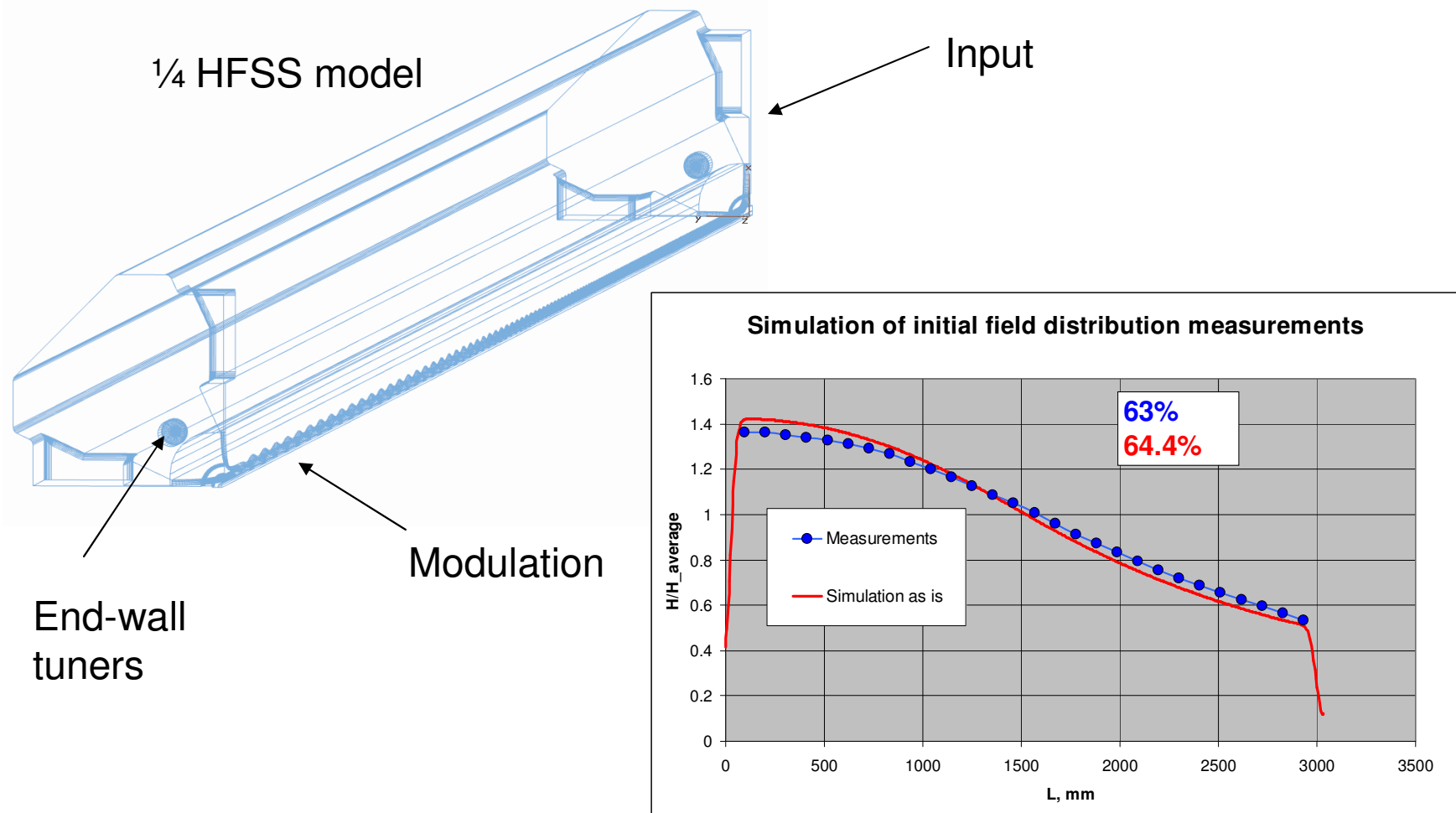
Frequency of cross-section with one period vane tip modulation (cell # 267)

Cross-section without modulation:  $F = 323.46$  MHz.  
Cross-section with modulation:  $F = 324.66$  MHz  
 $dF = 1.2$  MHz

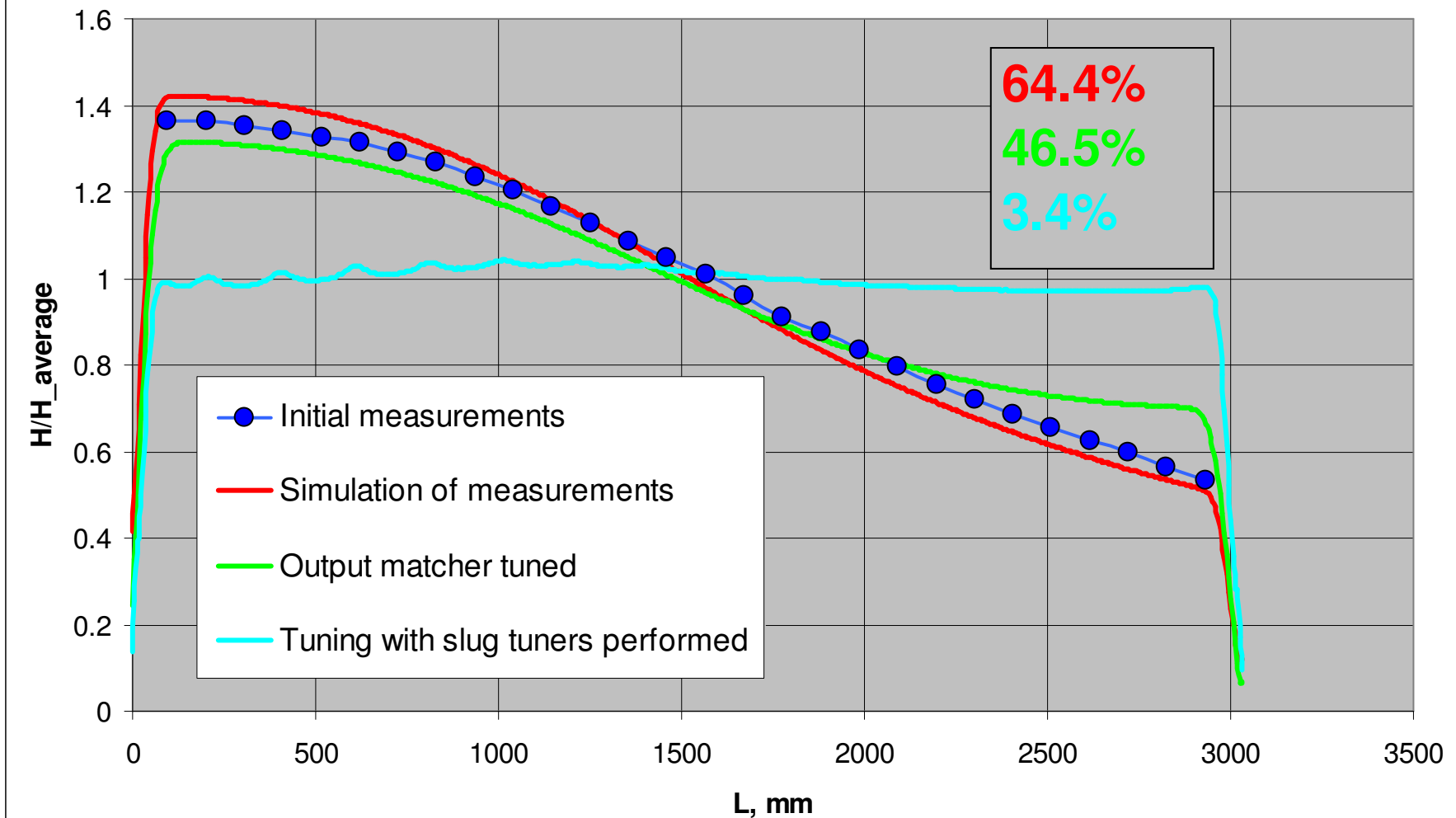
Deeper modulation –  
- higher frequency



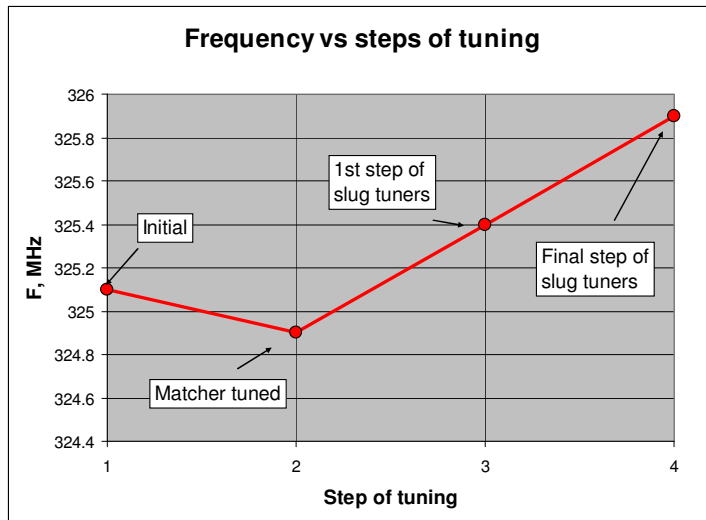
**Unique simulation: full 3D model of RFQ with modulated vane tips**  
**(before tuning, just to be sure we found the reason )**



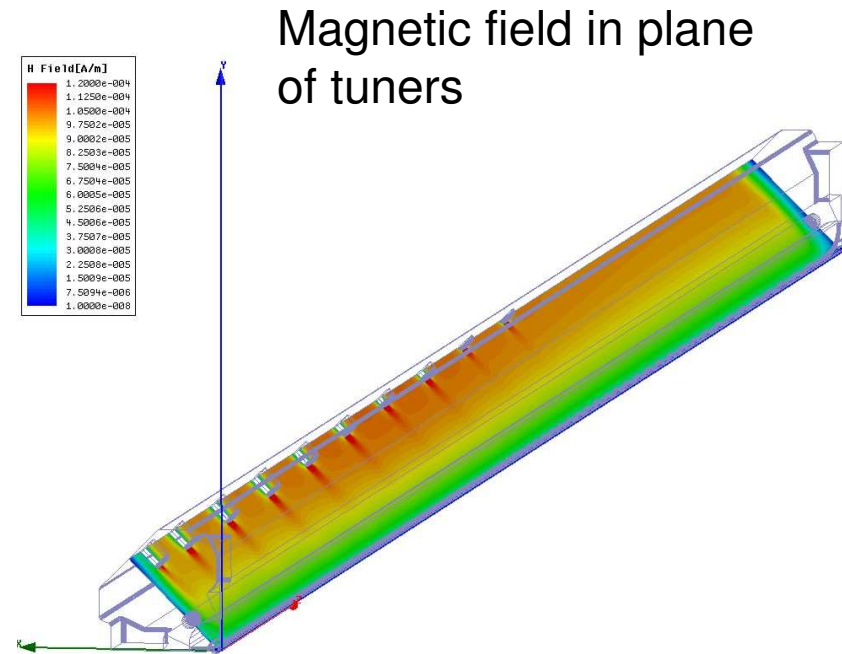
## RFQ. Field distribution tuning.



## Some details



Initial frequency before tuning with slug tuners must be 324 MHz at least



There will be additional losses and lower Q

Actual penetration of tuners will depend on how initial frequency tuning is done

Tuner	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Penetration,mm	20	20	20	20	16	12	8	8	4	4	0	0	0	0	0	0

## **Recommendations on final tuning**

After output cut-off is corrected we should provide lower initial frequency of RFQ to make using the slug tuners possible. It can be done by:

- additional machining of the vane walls (remove  $\approx 1$  mm)
- decreasing of average vane tip radius by 50-70  $\mu\text{m}$  uniformly along RFQ using thinner shims and gauges of smaller diameter.
- decreasing of average vane tip radius in high energy part of RFQ with deep modulation.